Citation:

Li F, Harmer P, Cardinal BJ, Bosworth M, Johnson-Shelton D, Moore JM, Acock A, Vongjaturapat N. Built environment and 1-year change in weight and waist circumference in middle-aged and older adults: Portland Neighborhood Environment and Health Study. Am J Epidemiol. 2009 Feb 15; 169(4): 401-408. Epub 2009 Jan 19.

PubMed ID: 19153214

Study Design:

Prospective cohort study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine associations between built environment characteristics (fast-food restaurant density, walkability) and individual eating-out and physical activity behaviors in relation to one-year weight change in adults.

Inclusion Criteria:

- English-speaking
- Age 50 to 75 years
- No sign of significant mental deficit
- Able to walk, including cane use.

Exclusion Criteria:

None reported.

Description of Study Protocol:

Recruitment

The sample was selected by using a stratified, three-stage, proportional-to-size cluster sample method

- The first stage involved the selection of census block groups, used as proxies for neighborhoods
- The second stage of sampling focused on individual households within selected

neighborhoods that were drawn randomly
- In the third stage, one eligible study participant within each selected household was chosen.

Design

Prospective cohort study design with one-year follow-up.

Dietary Intake/Dietary Assessment Methodology

Eating-out behavior was measured by asking participants two questions about the frequency of weekly visits to local fast food restaurants.

Statistical Analysis

- Neighborhood-level descriptive analyses were performed using analysis of variance to examine mean-level change in weight and waist circumference stratified by density of fast-food restaurants and walkability
- Major analyses were conducted by using multilevel modeling methodologies. The dependent variables were baseline-to-one-year follow-up change scores of body weight and waist circumference. Primary independent variables were density of fast-food restaurants and neighborhood walkability at the neighborhood level, and eating out at fast-food restaurants and change in moderate and vigorous physical activity at the resident level.
- Confounding variables included neighborhood-level covariates of residential density, median household income, percentage of non-Hispanic black residents and percentage of Hispanic residents and resident-level covariates of age, gender, education, race/ethnicity, household income, health status, smoking and BMI.

Data Collection Summary:

Timing of Measurements

Measurements were taken at baseline and one year.

Dependent Variables

Body weight and waist circumference were measured by study personnel at baseline and at a one-year follow-up by study.

Independent Variables

- Physical activity was measured at baseline and follow-up using Behavioral Risk Factor Surveillance survey questions
- Eating-out behavior was assessed at baseline and follow-up using two frequency questions about weekly visits to local fast-food restaurants
- Fast-food restaurant density was determined using geocoded data that established the number of fast-food outlets by square mile for each of the neighborhoods included in the study
- Walkability index was determined on the basis of a composite score consisting of land-use mix, street connectivity, public transit stations and green and open spaces.

Control Variables

Covariates included:

- Neighborhood-level covariates of residential density, median household income, percentage of non-Hispanic black residents and percentage of Hispanic residents
- Resident-level covariates of age, gender, education, race/ethnicity, household income, health status, smoking and BMI.

Description of Actual Data Sample:

- *Initial N:* 1,221
- *Attrition (final N):* 1,145 (57% male)
- *Age:* 62 years
- *Ethnicity:* 92% white
- *Anthropometrics:* Mean BMI was 29kg/m^2
- *Location:* United States.

Summary of Results:

- During the one-year follow-up, mean weight increased 1.72kg (SD=4.3), and waist circumference increased 1.76cm (SD=5.6) for the overall sample
- For high-density fast-food neighborhoods, a significant increase in weight and waist circumference over time was seen in those resident who made weekly visits to fast-food restaurants (3.0kg in weight, 4.47cm in waist circumference) ($P<0.05$)
- For high-walkability neighborhoods, the least increase in weight and waist circumference over time was seen in those for residents who increased their levels of physical activity (for moderate and vigorous physical additivity: 0.86kg and 0.19kg in weight, and 1.07cm and 0.41cm in waist circumference, respectively) ($P<0.05$)
- 18% to 19% of the variation in weight and 15% to 18% in waist circumference was due to between-neighborhood coefficients
- Multi-level analyses of those that when adjusted for neighborhood- and resident-level sociodemographic characteristics:
    - A high density of fast-food restaurants was associated with an increase of 1.4kg (3.09-lbs) in weight and 2.06cm in waist circumference among residents who frequently ate at fast-food restaurants
    - High walkability was associated with a decrease of 1.2kg (2.65-lbs) in weight and 1.57cm in waist circumference among residents who increased their levels of vigorous physical activity.

Author Conclusion:

The negative influences of the availability of neighborhood fast-food outlets and individual unhealthy eating behaviors jointly affect weight gain; however, better neighborhood walkability and increased levels of physical activity are likely to be associated with maintaining a healthy weight over time.

Reviewer Comments:

None.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes

3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	No
6.6.	Were extra or unplanned treatments described?	No
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	No
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes

8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes